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ADDENDUM

TO

Handbook

FOR THE

•303-in. VICKERS MACHINE GUN

(MOUNTED on TRIPOD MOUNTING, MARK IV).

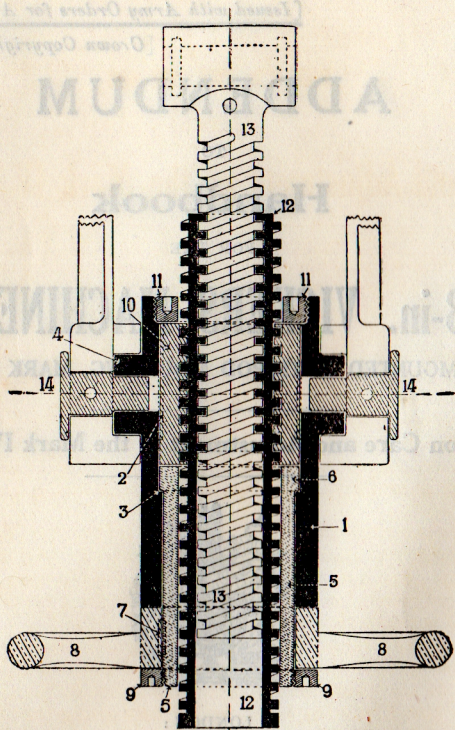
Notes on Care and Adjustment of the Mark IV Tripod.



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July, 1920.



NOTES

ON THE

Care and Adjustment of the Mark IV Tripod.

The following notes are drawn up as a guide, to Officers and others, for the detection of faults in the Mark IV Mounting.

Short instructions are given as to how these various faults can be put right, and the proper person qualified to carry out such repairs and adjustments as may be required.

Inaccuracy in shooting can, in nearly every case, be attributed to the mounting and not to the Gun.

Although play or wear, in any one particular part of the mounting may be so slight as to be almost negligible, yet there are so many places where play can originate, that the effect of it becomes cumulative, and can cause serious unsteadiness in the Gun.

The mountings must be overhauled by the Armourer every month, properly cleaned, re-oiled or greased. All taper pins and fixing pins must be tight, all adjusting screws and nuts properly adjusted, and the mounting left in a properly lubricated and serviceable condition.

Defects or damage should be reported directly they are discovered, so that they may be remedied without delay.

One of the chief causes of unsteadiness in the Gun can be found in the Elevating Gear, and before going into the details of where wear can take place, and the remedy to be applied, it is first necessary to understand the construction of the mechanism.

It is proposed, therefore, before embarking on details of wear and its remedy, to proceed with a description of the Elevating Gear.

The Nomenclature is given hereunder together with the reference numbers to the annexed drawing.

- | | |
|-----------------------------|-----------------------------|
| 1. TUMBLER. | 8. HANDWHEEL. |
| 2. Feathers, TUMBLER. | 9. NUT Hand-wheel. |
| 3. Shoulder, „ | 10. NUT, ELEVATING. |
| 4. Trunnions, „ | 11. NUT, Tumbler. |
| 5. BUSH, Handwheel. | 12. SCREW, Elevating Outer. |
| 6. Collar, BUSH, Handwheel. | 13. SCREW, Elevating Inner. |
| 7. Feather, Handwheel. | 14. PINS, Tumbler. |

TUMBLER.

The TUMBLER is a Manganese Bronze Casting. Commencing from the top, it is threaded internally to a depth of about a quarter of an inch to take the TUMBLER NUT.

It is then bored cylindrically for about two inches until a Shoulder is reached, which reduces the diameter about one-eighth of an inch, and is continued down to the bottom of the TUMBLER.

The upper cylindrical portion is provided with two Feathers which commence just below the screwed part, and these are continued downwards, stopping short about three-quarters of an inch from the Shoulder.

These Feathers are for the purpose of positioning the ELEVATING NUT and preventing its rotation.

The lower cylindrical portion is plain and of the same diameter as the BUSH which passes through it.

Externally, the TUMBLER is provided with two Trunnions which are bored out to take the TUMBLER PINS.

To the rear of the TUMBLER is a projection bored through

to take the JAMMING BOLT with NUT and POINTER. The rear of the TUMBLER is slit up from the bottom through the Projection for two inches in order to allow the JAMMING BOLT to operate.

BUSH, HANDWHEEL.

The BUSH is of Manganese Bronze. Externally, the upper portion is provided with a Collar of the same diameter as the upper cylindrical portion of the TUMBLER, the part below the Collar being of the same diameter as the lower cylindrical portion of the TUMBLER.

The Collar is provided with two featherways which allow the BUSH to pass through the upper portion of the TUMBLER when stripping or assembling, the Collar being seated against the shoulder in the TUMBLER.

The BUSH is now free to rotate, since the Collar has passed below the feathers on the upper cylindrical portion of the TUMBLER, and the lower portion of the BUSH projects about one inch below the bottom of the TUMBLER.

Towards the bottom of the BUSH is to be found a slot to take the FEATHER HANDWHEEL, and the bottom end of the BUSH is threaded to take the NUT, Handwheel.

Internally, the BUSH is bored out to the diameter of the OUTER SCREW to form a guide for the latter. It is also provided with two Feathers running the whole length which engage the Featherways on the OUTER SCREW.

FEATHER, HANDWHEEL.

This is a small piece of Steel, machined to fit the slot cut in the lower end of the BUSH. The Feather is provided with a small punch mark to indicate the side to be uppermost when assembling.

HANDWHEEL.

The **HANDWHEEL** is made of M.B., and its Hub is bored out to the same diameter as the **BUSH** over which it fits. It has a Featherway cut on the inside to enable it to pass over the Feather, and by this means it becomes locked to the **BUSH**.

NUT, securing HANDWHEEL.

Consists of a M.B. ring threaded internally, to screw on to the lower end of the **BUSH**, thus preventing the **HANDWHEEL** from dropping off. The outer surface of this ring is provided with two holes, to allow of its adjustment by means of a punch or other suitable tool.

NUT, ELEVATING.

This is a steel nut about one and three-quarters of an inch in length.

Externally, it is cylindrical, and turned to the same diameter as the upper cylindrical portion of the **TUMBLER**, and is provided with two Featherways running the whole length of the **NUT**. These Featherways engage with the Feathers on the inside of the **TUMBLER**.

Internally, the **NUT** is provided with a double left-hand thread to take the **OUTER SCREW**.

When in position the lower end of the **NUT** bears against the collar of the **BUSH**, and is retained in this position by means of the **TUMBLER**.

NUT, TUMBLER.

This **NUT** consists of a M.B. ring. Externally, it is threaded to screw into the top of the **TUMBLER**; internally,

it is bored out plain to the same diameter as the **OUTER SCREW** and allows the same to pass freely through.

The top side of the **TUMBLER NUT** is provided with two holes to allow of adjustment by means of a punch or other suitable tool.

When in position this screw is screwed down tightly against the top of the **ELEVATING NUT** on which it bears, thus keeping the latter in position.

SCREW, ELEVATING, OUTER.

This Screw is made of steel and has a hole running throughout its length.

Externally, it is provided with a double left-hand thread to fit the **ELEVATING NUT**.

The lower end of this Screw has a Collar which acts as a stop to prevent its being screwed out of gear.

Throughout the whole length are two Featherways which engage with the Feathers on the inside of the **BUSH** when the Screw is assembled.

Internally, the **OUTER SCREW** is provided with a double right-hand thread which extends from the top to midway, and through which the **INNER SCREW** works. The lower half is drilled out to the full diameter of the **INNER SCREW** and is cylindrical and unthreaded.

SCREW, ELEVATING, INNER.

The **INNER SCREW** is also made of steel with a solid shank.

The upper portion is formed into a bearing to take the **ELEVATING JOINT PIN**.

The shank is threaded with a double right-hand thread which screws into the top of the **OUTER SCREW**.

Just below the bearing will be found a small hole drilled through the shank to take a split pin to which is attached the CHAIN, SECURING JOINT PIN, and CHAIN, SECURING ELEVATING GEAR. This attachment prevents the INNER SCREW from becoming unscrewed, and consequent loss.

BOLTS, JAMMING, with NUT and POINTER.

This is a half-inch steel bolt which passes through the holes provided in the rear projections of the TUMBLER, the POINTER, ELEVATING DIAL, being gripped between the two projections.

On the NUT being tightened up it contracts the lower portion of the TUMBLER, and by this means the requisite amount of grip can be imparted to the HANDWHEEL.

PINS, TUMBLER.

These Pins are made of steel and turned to two diameters, and provided with a flat head. They are positioned in two holes drilled through the extremities of the CROSSHEAD, and are secured in position by fixing pins.

The ends of their shanks project inwards and are seated in the holes in the TUMBLER TRUNNIONS.

ACTION OF THE MECHANISM.

On rotating the HANDWHEEL the movement is transmitted to the BUSH to which it is keyed by means of the Feather.

The BUSH in its turn rotates the OUTER SCREW to which it is keyed, by means of the Feathers on the inside of the BUSH being engaged in the featherways of the OUTER SCREW.

The OUTER SCREW, on being rotated, working in the ELEVATING NUT, rises or falls according to which direction the HANDWHEEL is rotated.

The INNER SCREW, which works inside the OUTER SCREW, and is itself prevented from rotating by being attached to the Gun, is therefore forced upwards or downwards according to which direction the HANDWHEEL is rotated, for the reason that the threads work in *opposite directions*.

If both threads of the INNER and OUTER SCREWS acted in the same direction it will be seen that as fast as the OUTER SCREW was screwed up, it would climb up the INNER SCREW, and there would be no movement transmitted to the Gun.

STRIPPING ELEVATING GEAR.

Stripping the ELEVATING GEAR should not be undertaken unless for the purpose of repair, and then only by the Armourer.

It is not advisable to remove the TUMBLER from the BRACKET, unless absolutely necessary, owing to difficulties connected with the fixing of the TUMBLER PINS.

The sequence of operations for stripping is as follows:—

1. Disconnect Split Pin, Securing Chains and Joint Pin, from head of INNER SCREW.
Frequent removal of this Pin soon results in its fracture.
2. Unscrew INNER SCREW.
3. Unscrew NUT, securing HANDWHEEL.
4. Slide off HANDWHEEL.

This may sometimes present difficulty, owing to the HANDWHEEL being tight on the BUSH, and it may be necessary to resort to the use of the

raw-hide mallet to drive it off. In doing this, in order to prevent possible damage to the ELEVATING DIAL, the latter will have to be removed.

5. Remove Feather from HANDWHEEL, BUSH.
6. Unscrew the JAMMING BOLT with nut and pointer.
7. Unscrew the TUMBLER NUT.
8. Take hold of the OUTER SCREW at the top and withdraw it from the TUMBLER, at the same time bring out the ELEVATING NUT attached to it.

This operation can be assisted by applying pressure from below on the BUSH.

Should there be any washers present on the top of the ELEVATING NUT, care must be taken to see that they do not become jammed during this removal.

9. The BUSH is now removed by pushing up from below, care being taken that the Featherway on the COLLAR of the BUSH is in alignment with the Feathers on the inside of the TUMBLER.

ASSEMBLING.

Reverse the above procedure.

1. In replacing the BUSH see that the Featherways on the COLLAR are in alignment with the Feathers on the inside of the TUMBLER.
2. When replacing the ELEVATING NUT see that the washers, if any, are replaced on the top where the TUMBLER NUT bears down on it.
3. When replacing the FEATHER, HANDWHEEL, see that the punchmark on the Feather is to the outside.

4. When replacing the INNER SCREW, make sure that it projects from the top of the OUTER SCREW the same distance that the OUTER SCREW projects from the top of the TUMBLER NUT.

EXAMINATION, ADJUSTMENT, AND REPAIR.

For the purpose of Examination the following sequence is adopted :—

1. LEGS.
2. SOCKET.
3. CROSSHEAD AND PIVOT.
4. ELEVATING GEAR.

LEGS.

The LEGS are very strong but occasionally become slightly bent. These can be straightened in the forge.

If badly bent or dented, they will have to be returned for factory repair.

Armourer or
duly qualified
Artificer.

Machine
Gunner.

Armourer or
duly qualified
Artificer.

CLUTCH PLATES.

The greatest care must be taken to ensure that the teeth of the CLUTCH PLATES are kept clean and free from grit.

Burrs on the teeth can be removed by a file, and at the same time make sure that the three screws securing the CLUTCH PLATES are tight.

It may happen that the "STUDS, FRONT LEGS" become bent, thus preventing the CLUTCH PLATES from seating correctly one against the other, it will then be found impossible to tighten up the Clamping Handles which should be approximately vertical.

Armourer.

To remedy this fault, the STUDS will have to be removed and straightened in the forge.

This operation is not easy, and skill and care is required to carry out this repair satisfactorily.

THE SOCKET.

The SOCKET itself is substantial and not liable to come to any harm; the bearing surfaces are shielded from external blows.

Armourer or
duly qualified
Artificer.

Occasionally, the JAMMING HANDLE may become twisted off, though this breakage is uncommon. Or, the JAMMING BLOCK may become worn and ineffective.

In both cases the Boss must be removed, and care must be taken in doing so to first remove the fixing pin.

In replacing a new JAMMING BLOCK it must be ensured that the head of the steel screw does not protrude so as to cut into the pivot itself.

The upper and lower bearings in the SOCKET must be kept clean and free from grit.

Armourer.

If found to be worn, these bearings can be lined with plastic metal, but in cases of this sort it is better to have the repair carried out by Ordnance.

CROSSHEAD.

PIVOT.

Armourer or
duly qualified
Artificer.

Examine the upper and lower bearings for wear. These bearings should be absolutely smooth and true, and must not be filed, except to remove small burrs, and then only with a dead-smooth file.

Armourer.

If these bearings are found to be badly worn the same remedy applies here as is mentioned in the last paragraph of the previous section.

Ascertain that the pivot is right home in its bearings, and that its movement is not in any way interfered with by incorrect fitting of the DIRECTION DIAL.

Should the PIVOT not seat correctly, the JAMMING BLOCK will cut into the Pivot bearing instead of running in the channel provided, and the PIVOT will be unsteady.

CROSSHEAD JOINT.

It is often found that the JAWS have become widened, and consequently, when the Gun is mounted, there is considerable lateral play.

This widening is brought about by various causes, continual tapping on the rear portion of the Gun being mainly responsible.

Armourer.

This defect can easily be put right. The metal of which the casting is made is soft, and by judicious knocking with a raw-hide hammer, or perhaps a block of wood, the blows being given alternately, on either side of the JAWS, the JAWS can be closed to any degree of tightness, until the

Gun can be slipped into position, with a slight pressure.

A METAL HAMMER MUST ON NO ACCOUNT BE USED.

BEARINGS.

From the continual insertion and withdrawal of the CROSSHEAD JOINT PIN, these bearings become very much worn in time, and become a prevalent source of unsteadiness. This unsteadiness is much accentuated, should the JAWS be overwide.

Ordnance
Workshop.

There is no satisfactory method of treating this defect short of re-bushing with the steel Bushes provided for the purpose.

Keeping the JAWS well up, will, in a great degree, overcome this unsteadiness.

JOINT PINS.

These PINS must be straight and smooth and should make a nice sliding fit through CROSS-HEAD and Gun.

Machine
Gunner.

They must not be filed down in any way to make a loose fit. Except for the removal of any small burrs, which can be taken off with a smooth file, they must not be otherwise interfered with.

Armourer or
duly qualified
Artificer.

The PINS are provided with a feather which serves a useful purpose, and these are not to be removed. Should they become broken off they can be replaced.

Should the PINS become very badly worn they should be replaced by new ones.

ELEVATING GEAR.

JOINT PINS.

The same remarks apply to these PINS as to the CROSSHEAD JOINT PINS. And if they become very badly worn they should be replaced.

TUMBLER.

It may be found that the TUMBLER becomes loose on its TRUNNIONS, due to the wear of the TUMBLER PINS in their bearings; this gives rise to lateral play.

Armourer.

This can be overcome temporarily by removing the TUMBLER and swaging in the bearings with a "ring punch."

ELEVATING NUT.

Slight vertical play in the ELEVATING NUT may arise from wear between the COLLAR of the BUSH and the Shoulder of the TUMBLER.

Machine
Gunner.
Armourer.

This may be taken up by screwing in the TUMBLER NUT if it has been unscrewed.

Should this wear be so great that, even though the TUMBLER NUT is screwed in to its limit, there is still vertical play, it will then be necessary to insert a thin metal washer or washers on top of the ELEVATING NUT. Tinplate washers being provided for the purpose.

As a temporary expedient a cardboard washer can be used.

HANDWHEEL.

Machine Gunner. When end wear is shown between the Hub of the HANDWHEEL and the bottom of the TUMBLER, it may be possible to take this up by screwing up the NUT, securing HANDWHEEL.

OUTER SCREW.

When the threads become very much worn and there is play, the SCREW will have to be exchanged.

INNER SCREW.

If the threads become very much worn this SCREW will have to be exchanged.

Armourer. If the hole for the Joint Pin becomes enlarged it can be heated and swaged in, and the hole reamed out to size. This operation is not usually very satisfactory, and the SCREW had better be exchanged.

NOTE.—The ELEVATING GEAR as a whole can be tightened up by any Machine Gunner by screwing up the Jamming Bolt, care being taken that the jaws do not seize.

If the thickness of the pointer should interfere with this operation it can be removed and filed down.